Science and conservation: towards alternative strategies for protecting Australia's biological resources

THE INAUGURAL ALLAN SEFTON MEMORIAL LECTURE

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A Tribute to Allan Sefton

Employed at the Port Kembla Steelworks, Allan Sefton devoted himself to studying and recording the natural history of the Illawarra. A committed conservationist, Allan published extensively in the local papers and the journal of the Illawarra Natural History Society. His accounts of the Illawarra's flora and fauna raised community awareness of the area's unique natural history and the need to protect the local environment to conserve its wildlife. In an era when most conservationists fought to protect wilderness, Allan Sefton worked to save the wildlife in the backyards of Wollongong and its environs. Few cities can boast such an energetic and successful advocate of sound environmental management and the benefits of integrating the natural environment with a landscape dominated by industry and human society. His efforts were recognized with the award of the British Empire Medal in 1975 and the Australian Natural History Medallion in 1978. The University of Wollongong recognized his contributions to science and conservation by awarding him an honorary PhD in 1989. Regrettably Allan died before he could receive his award.

Allan Sefton's contributions to environmental science were also honoured by the establishment of the Allan Sefton Memorial Fund at the University of Wollongong by the Wollongong City Council and BHP. The funds have been used to establish an award for the best student graduating in the honours Bachelor of Environmental Science programme at the university and to sponsor an annual Allan Sefton Memorial Lecture. The first of these lectures was given in September 1993 by Dr. Harry F. Recher of the University of New England, Armidale and is published here in an edited form.

OPENING

Many of you will have heard of the great American civil rights leader, Martin Luther King, Jr. King was awarded the Nobel Peace Prize in 1964 for his efforts to resolve the civil rights conflict that tormented American society in the 1950s and 60s. In 1968 he was assassinated, but his words are immortal.

"I Have a Dream"

Martin Luther King dreamed of an America where little white boys and little black girls, little black boys and little white girls could walk hand in hand down the streets of an America free of racial hatred and intolerance.

His dream was of freedom, of hope, of opportunity. A dream that all Americans could share. A dream that would bring prosperity and richness of life to all people regardless of age, gender, race, or religion.

His dream was for the future and of the future.

I Also Have a Dream

I dream of a world where the air is clean. I dream of an Australia where the rivers are pure and the oceans free of pollution. Of an Australia where the mass extinction of our native wildlife is a threat of the past. An Australia where the land and the trees are healthy and productive.

My dream is also one of freedom, of hope, of opportunity. It is also a dream of the future; a dream that would bring prosperity and richness of life to all people regardless of age, gender, race or religion.

It is a dream I share with thousands in the Conservation Movement. It is a dream shared by most of the world's ecologists. It is a dream that I am sure I would have shared with Allan Sefton in his campaign to protect the beauty and natural history of the Illawarra Region.

My dream is like Martin Luther King's dream; it requires a transformation of society. It requires fundamental changes in the way we think of ourselves and of our attitudes to other people and to the countless other species that we share this planet with.

We need to begin to measure success not by how much we consume or produce, not by our possessions or monetary wealth, but by the health and well-being of our lives and of our environment. By our opportunities. By the diversity of choices available to us. By the diversity and richness of life.

We need to see ourselves as part — just part — of the world. A world that is an endless spiral of life with which we are one. We need to begin to think less in terms of individuals and of rights and more in terms of responsibility and caring. We need to recognize and admit the consequences of our actions on others, on other species, and on the future. We need to place our responsibilities first and our self-interest last. We are part of an ecosystem; a system that exists for all, not just the lucky few. And not just for people.

Many of us would profit by paying more attention to the ways in which Aboriginal people express their relationship to the land, to each other and to the future. They see themselves as one with the land, just as we are. They are part of the future and of the past, just as we are.

THE FUNDAMENTAL CHANGES

In this paper I address some of the things that we need to do to protect and restore Australia's biological resources. Some are alternatives to current actions and policies. To many, they may appear radical and uncompromising, naive and politically impossible.

I recognize all those things; I also accept the need for change.

I also say some things about the role of science and scientists in Australian society, both from my view of the need to better protect continental biological diversity (that is, the richness of life) and of the failure of Australia's scientists, particularly Australia's ecologists and their professional societies, to be more involved in preventing and resolving Australia's environmental problems.

I am reminded of the words of E. F. Schumacher ("small is beautiful"):

"People ask 'Will we survive the present age?' If I should answer 'Yes,' they will lapse into complacency. If I should answer 'No,' then they will be filled with despondency. It is better for now that we leave the question unanswered whilst we all set to work to resolve the problems of survival."

Those words hung beside those of Bill Mollison at Amery Acres in the Shire of Dowerin in the wheatbelt of Western Australia. Mollison's words were:

". . . all of us . . . are . . . concerned that we leave a continent in which our own children and grandchildren can survive and exist and have a good life . . . a healthy life."

Mollison expresses the concerns that drive my life. Schumacher's position is one taken by many scientists and it is a position that I review each time I prepare a public talk or a lecture for students. Each time I reach a different conclusion from Schumacher.

I disagree that it better to leave the question unanswered. It is better to present the facts as we know them and let people know what the future will be like given different courses of action. We may not like the future. We may not even like the choices, but by not answering the question of survival we risk following the same paths to the future that we have followed to the present. Paths that place our very survival at risk.

If you disagree and feel that the world understands the consequences of its actions and that there is no need to describe the magnitude of environmental problems facing Australia and the world as we enter the 21st century, then consider the words of the Chief Minister of the Northern Territory, Mr Perron, when he warned that Australia's small population was a luxury that the nation could not afford; that it was an "anachronism" (*The Australian*, 16 September, 1993, p. 2). Mr Perron suggested that the world might pressure Australia into greatly increasing its population (presumably to relieve population pressures elsewhere in the world) and argued that *"By even the most conservative standards the north has the capacity to sustain more people than the nation's total population of today."*

Mr Perron's opinions are common in Australian society. Probably a majority of Australians view Australia as underpopulated and empty; an unspoiled continent of vast potential.

If you disagree and believe Mr Perron is alone in his views, consider that neither the New South Wales nor Western Australian Governments allocated adequate funds in their most recent budgets for even the most basic needs of their nature conservation agencies. Consider that in the decade since its adoption, there has never been a national review of the National Conservation Strategy and that New South Wales has yet to produce a State Conservation Strategy. Consider the opposition to wilderness protection and the demands from irrigators for yet more water from rivers that have become little more than drains for farm wastes and urban effluents. Consider the demands of the timber industry that they be allowed to log the last fragments of our old growth forests.

There is, of course, much that is positive. We have made progress. Progress in environmental management and awareness is evident in the growth of Landcare, in the planting of millions of trees, in the thousands that belong to conservation groups, in the concern of young people for the environment, in the support shown to Green political parties in the public opinion polls (*Time*, 30 September, 1993, p. 14), and in the prominence of environmental issues in the media. Among many initiatives, governments have moved to replace ozone depleting gases with "environmentally friendly" substances, to reduce the emissions of greenhouse gases, to eliminate leaded petrol, to identify and protect areas of World Heritage, to regulate trade in endangered species and prepare global biodiversity conservation initiatives, to protect whales, and to better manage world fisheries. Australia participates in all of these initiatives. In many, such as the protection of whales and the Antarctic, it is a leader.

There is much that is good, but, despite the progress, there is much that must be done. Not only is there much that remains to be done, but action is required more quickly than most governments and community leaders recognize or are prepared to admit.

Population and Resource Consumption

There is no greater change required in Australian society than the need to address problems of population and resource consumption. While Mr Perron may see Australia as underpopulated, I see it as overpopulated. Based on the extent of land degradation, the rate of loss of continental biological diversity, and air and water pollution, the capacity of Australia to sustain its human population at current standards of living has probably been exceeded by a factor of two. Of course, in my evaluation of our standard of living, I place great weight on the things that cannot be bought and sold — clean air, clean water, open beaches, quiet, the songs of birds at dawn — but mean so much to the quality of life.

To double the population, as Mr Perron proposes, will do nothing to improve environmental quality or the quality of life of most Australians, nor can it relieve population stresses elsewhere in the world. Were Australia to take the annual increase in the world's population (93 million people), within a decade our population would equal that of India's and be second only to China. To take only 18 million and settle them in the north would irreversibly destroy the last parts of the continent that remain relatively undisturbed by Europeans and do little or nothing to help the world. Australia also has a responsibility to the world to conserve its biological riches for all to enjoy.

I do not intend to pursue the issues of population at length. I raised them for two reasons:

Firstly, we cannot achieve sound environmental management with an ever expanding population. This is particularly so when 80 per cent of the world's population lives in the less developed nations, but aspires to the same material standard of living as the people who live in the more developed nations, such as Australia. The 20 per cent in the developed world already use 80 per cent of the world's resources. Australia is part of this contradiction. Either we all accept less (much less for some of us) or we find some way to increase global resource consumption by four and then eight and then sixteen times and somehow leave space for other species while keeping the air breathable and the water clean. The technologists say it is possible, the economists say it will happen (as soon as it is necessary), and the ecologists say it is impossible.

We must publicly address problems of population growth with the view of deciding as a nation how many people we want or need. These are not issues of genocide or prejudice, but are ones of survival. Australia must set a standard for the world that is compassionate, but above all else, a standard that is environmentally sane. Growth is not an option in an ecologically balanced world.

Secondly, community attitudes to population expose the flaw in Schumacher's idealism. People will do nothing as long as they believe there is no need for concern. They may also do nothing, if they realize the truth and become despondent. But, if they do not know the truth about the world's and Australia's environment and the impact of population growth, they will also believe there is no need for concern and do nothing. It is views, such as those expressed by Mr Perron, that convince me it is better to tell the truth — no matter how depressing this may appear — than to leave the question unanswered.

Left unanswered, we will always repeat the mistakes of the past that have led to environmental degradation and a poorer quality of life. If we have great material wealth, it is because we have stolen it from the future and from the other organisms with which we share the planet. We have also stolen from each other.

It is also true that the environmental problems we face in Australia are not solely the result of too many Australians. Australia's resources are exploited not only to sustain the people living in Australia, but millions who live on other continents. Our environmental problems are also a consequence of the way we have used technology and science. They have arisen because we have sometimes used the wrong technology, sometimes because we have only used part of information available to us, sometimes we did not understand, and very often because we have wanted too much in too little time. Control of the world's human population answers only half of the equation; the other half that must be addressed is the issue of how much each individual consumes during their lifetime.

The more each of us wants and the more each of us consumes, the fewer the number of people the continent and the world can sustain in perpetuity. It also follows that the more each of us uses, the less there is for other species. As our material standard of living increases, it is inevitable that the biological diversity of the world will decrease and the poorer the world we leave our children.

We all need to use less, to use what we need more carefully, and to be more efficient in the use of the future's resources. Better technology and better use of technology will help, but until we limit population growth and, for all to have an equal and fair share, using less is something we will need to accept.

The answer to Schumacher's question is "Yes, we will survive," but it will be a poorer world, a world devoid of diversity. It need not be poorer. We know what the problems are, we know the causes, and we have the solutions. We only need the will and understanding to resolve the problems and ensure a world that is richer, not poorer.

State of the Continent

Within the next 50 years, the world's population will double to nearly 12 billion people. On present trends, Australia's population will increase from its present 17.5 million people to 30 million by the year 2030. Coupled with greater expections for material well-being, these increases will place unprecedented demands on world and continental resources. Demands that will increasingly threaten the survival of the world's and Australia's biological diversity. The rate of extinction will increase as the world population grows and increasingly large areas of species rich tropical forests, including the incredibly rich eucalypt forests and woodlands of Australia, are cleared for agriculture and forestry.

In 205 years of European settlement, more than half of Australia's forests and 60 per cent of its woodlands have been cleared or severely degraded. As little as 5 per cent of the continent's original vegetation may be undisturbed. By one estimate 45 per cent of land in non-arid regions and 55 per cent in the arid zone is degraded and requires restoration. Such estimates are probably conservative and do not reveal the full extent of degradation. No river or stream of consequence south of the Tropic of Capricorn is uncontaminated by agricultural, domestic and industrial wastes. None is free of introduced plants and animals. None is unregulated. There are no untouched wetlands — 50 per cent have been drained. Degradation of estuaries and marine coastal waters is evident around the entire Australian coast, only being worse near population centres. It now threatens the survival of Australia's greatest biological treasure, the Great Barrier Reef.

Degradation is the result of land, forest and water management practices that include the disposal of industrial, agricultural and domestic wastes intended to maximize short-term economic gain and sustain population growth without consideration of their long-term impact on the capacity of the continent to nourish life. A consequence of degradation is the extinction of species and the loss of biological and cultural diversity at regional and national levels. The scale of degradation and loss of biodiversity places national efforts to achieve sustainability in agriculture, forestry and fisheries at risk. Even the best managed fisheries are now at risk from over exploitation; most are not managed properly and many have already collapsed. It is debatable that our agricultural and forestry systems are any better.

As Asian countries become increasingly affluent, their demands for seafoods will even more rapidly deplete the ocean's resources than they do at present. Australia has experienced the consequences of these demands with the collapse of the bluefin tuna, abalone and lobster fisheries to supply foreign markets. As the numbers of whales increase, the clamour from Japan to resume full scale whaling to obtain meat for human consumption intensifies. Instead of questioning these demands as we do with the resumption of commercial whaling, Australians have been too often lured by the promise of easy wealth and blind to the loss of our fisheries. Problems on the land are no worse, and no better.

Twenty-two species of Australian mammals (nearly 1 in 10 of the continent's mammal species) are extinct and another 40 species are threatened with extinction. The loss of mammals is the highest for any continent (only 1% of the world's species of mammals have become extinct since 1600) and by itself illustrates the difficulties the nation faces in conserving its native plants and animals. The loss of species is not restricted to mammals. Among birds, one species, the Paradise Parrot, is extinct, but throughout southern Australia more than 90 per cent of terrestrial or land bird species have declined in abundance and it is my view that 1 in 5 are threatened with virtual extinction during the next century. Recent studies in Victoria have found that of 188 species of landbirds previously considered to be "common", 93, or almost half, have become locally extinct or have declined in abundance throughout the region. Even the conservative estimates under the *New South Wales National Parks and Wildlife Act* (1974) as amended by the *Endangered Fauna (Interim Protection) Act* (1991) places 23 per cent (110 species) of the state's 473 species of birds on the endangered list.

On a continental scale we are on the verge of losing — for all time — the entire community of woodland birds. The whole woodland ecosystem from Western Australia to Tasmania to Queensland is endangered! Since the 1930s, that is, within the lives of many Australians, I estimate that more than 85 per cent of woodland bird species have declined in abundance by more than 80 per cent solely as a consequence of expanding agricultural activities and land clearing. Without habitat the numbers of birds (and all other animals) must decrease in proportion.

On one estimate at least 30 of the continent's 180 species of frogs are threatened and one is extinct. It is only the lack of information that prevents similar analyses for reptiles and insects on a national scale. The status of insects cannot even be estimated, as recent collections show that most species are unknown to science. In a collection of 45 000 individual insects and spiders comprising more than 1 000 species from an area of remnant ironbark woodland near Sydney, more than 90 per cent are undescribed. Many of these species were represented by only a few individuals suggesting that extinction rates among insects could be high as habitats are cleared or otherwise modified. The area of remnant woodland in which the collection was made is Crown Land, but only partially protected as a conservation reserve. The largest part of the remnant is a proposed housing estate. How many species will be lost when that development proceeds, as it inevitably will to accommodate the growth of Sydney's human population?

The story is no different for plants or fish. More than 3 000 or 1 in 7 of the continent's vascular plant species are listed by the Australian Nature Conservation Agency as rare or threatened. Ninety-seven of these are presumed extinct. In Victoria, the only state to complete a comprehensive survey, 33 of 44 species of native fish are extinct or endangered. On a visit to Hobart in 1993, I was advised that the situation is worse in Tasmania where most native fish have been endangered by hydro-electric schemes, poor farming practices, and by introduced trout. According to the Australian Nature Conservation Agency, of the continent's 217 freshwater fishes, 8 per cent (18 taxa) are threatened with extinction. Twenty-five per cent (54 taxa) have declined in abundance since European settlement or have a restricted distribution.

To put Australia in a global perspective, biologists from Oxford University and the World Conservation Monitoring Centre in the UK predict that half of the world's 47 000 species of vertebrates will become extinct within the next 600 years. Half of the world's 4 500 species of mammals and 9 500 species of birds will become extinct in the next 200 to 300 years. For vascular plant species, half will disappear in the next 1 000 to 2 000 years. Accompanying these losses will be an incalculable loss of non-vascular plants and invertebrates in both aquatic and terrestrial environments. I would argue that the estimates reached for the rate of extinction of the world's avifauna are not much different from mine, when I predict a wave of extinction of Australia's avifauna during the first half of the next century when as many as 100 species might be lost. In reality, it hardly matters whether we lose half of the world's birds in the next 50 years or the next 200, or whether it is 100 or 10 species of Australian birds that become extinct in the next 50 years. That we can even contemplate such losses is a terrible indictment of the way we treat the continent and the planet.

Losses of the magnitude that I have been discussing may compromise the capacity of the planet to sustain human civilization and threaten world and national programmes for ecologically sustainable development. In his report on the *Threatened and Extinct Birds of Australia*, Stephen Garnett suggests that the loss of biodiversity is an indication that our activities are not sustainable. Although the precise relationships between ecosystem functions and species richness are not clear, it is reasonable to assume that there is a minimum level of species richness below which communities and ecosystems will cease to operate. The loss of species on the scale predicted will almost certainly affect such basic ecosystem services as soil formation, water purification, and the moderation of local, if not global, climates.

Do we need to change?

Australia's most serious environmental problems are largely the consequence of inappropriate agricultural activities and it is impossible to escape the conclusion that current land use practices in Australia are unsustainable. The clearing and fragmentation of native vegetation, the introduction of exotic species, and the misuse of agricultural chemicals and fertilizers have been major factors in the degradation of terrestrial and aquatic ecosystems and the decline in continental biodiversity. The loss of species on the scale that accompanied agricultural expansion not only degraded the quality of human life, but warns us that we may have exceeded the continent's capacity to maintain agricultural production and manage its forests and fisheries on a sustainable basis.

Neither industry nor government appears to understand the relationship between sustainable development and the conservation of native plants and animals. Sustainable development means that development progresses **without** destroying or degrading the biological wealth of the world. Where development has already degraded landscapes and threatens the survival of species, it is necessary to emphasize the rehabilitation or restoration of biological communities even if this means a reduction in economic growth and production.

The loss of continental diversity, as a consequence of inappropriate management, is a continuing and accelerating process. A diverse landscape is not only necessary to restore degraded environments, but it is a fundamental requirement for the maintenance of individual freedoms and a quality life. It is clear from the extent of its degraded lands and waters and the loss of species, that Australia needs to place more emphasis on restoration and less on growth. I do not hear these views coming from Canberra, any state government, or from the Business Council, but you do hear it from the Australian Conservation Foundation.

The renewal of degraded landscapes will require the establishment of relatively complex and species rich (that is, biologically diverse) plant and animal communities. These are necessary to restore ecological functions and, as such, are fundamental to achieving sustainable agriculture, forestry and fisheries. The extent of landscape degradation and the loss of biodiversity is such that, in the short- to medium-term, Australians may need to accept a reduction in agricultural production. There will also need to be smaller harvests of timber from native forests and fewer fish taken from our waters. Reduced yields have already been forced upon us by the over-harvesting that has taken place in the past. Reduced production does not mean standards of living will have to be lowered, but it does mean greater emphasis on cultural and educational development and less emphasis on material wealth.

If we accept that the integration of agriculture and the conservation of biological diversity is essential for achieving ecologically sustainable development, then there will need to be significant changes in land management and urban lifestyles. This includes an end to the clearing of native vegetation, the allocation of water resources to nature conservation, a reduction in energy consumption, and greater controls on the use of fertilizers and agricultural chemicals. The availability of fertilizers for use on urban and suburban gardens needs to be restricted. At the risk of repetition, I remind you that no progress in the restoration of biological diversity or in achieving goals of ecologically sustainable development can be made without a reduction in population growth. In the long term, it will be necessary to accept a smaller population for Australia.

The Role of Scientists

Despite the recession, the environment is a major concern of Australians. In polls carried out during 1992, only unemployment was considered more important in the short-term, while the health of the environment dominated such traditionally important issues as the economy, education and welfare in people's perception of their long-term well-being. It is evident that concern for the way we use and manage our natural resources as well as our awareness of environmental degradation and the need for more effective conservation programmes has been incorporated into the way society functions. The issues will change, but the environment will remain on the political and social agenda through this decade and into the 21st century.

It would be nice to say that public knowledge of environmental issues arose from the efforts of scientists, but the development and growth of the environment as a political and social force for change is a product of the media and the advent of mass communication.

The presentation of environmental events in simple English has been and will remain fundamental to the development of an environmental ethic and to the understanding of environmental issues by the public. Most people have not been trained in the sciences and only a minority have tertiary education. Simple English, clear expression and a brief message are the hallmarks of effective science and environmental communication with the lay public.

Unfortunately few scientists make an effort to communicate with the media or with the lay public. There are those, like David Suzuki, Charles Birch and Denis Saunders among others, who **are** outstandingly good communicators, but when others try, they are unable to put their message in a form that is easy to understand. Communication, of course, was one of Allan Sefton's great skills. There are two issues:

- *The first* is the failure (the unwillingness) of scientists to communicate the results of research directly to the public. The way to do this, of course, is through the media in the broadest sense and not just via elite science programmes geared to an educated audience.
- *The second* is the difficulty most scientists have when trying to communicate in simple language; many cannot communicate at all.

There are reasons why scientists have difficulty in communicating:

- Many Australian scientists are prevented from speaking publicly or with the media because of restrictions imposed by their employers (mostly government departments or agencies). Others are afraid that their public comments will affect their careers, jeopardize research funds or lead to restrictions on their research (e.g., obtaining permits to work in particular areas). These concerns are especially apt in the context of the environmental debate where many issues are emotional and have political and economic implications.

  The fears are real and any Australian scientist who has taken a public position or merely provided information on controversial environmental issues (e.g., forestry, water pollution, misuse of agricultural chemicals, environmental threats to human health) has experienced the jibes and retributions of employers and colleagues.
- Articles written for lay people or lectures to public (non-professional) audiences are given little value or weight in decisions about promotions and research support.
- Most scientists who are educated at Australian (or British) universities receive little or no instruction in communication. They enter university with high school level verbal skills (which are poor), and they receive their Ph.D with about the same level of expression. On the way to their degrees, they acquire the language of the field of their speciality and to survive (pass) they learn to use jargon instead of the simple English they and their supervisors are incapable of writing. After all, it is only necessary that they be understood by other specialists in the same field.

  A consequence is that a disdain for communication develops (to the point that few scientists even attend departmental seminars outside their area of specialization) and especially of communicating with the public. Since they do not know how to communicate, in self-justification, many scientists deride the efforts of others and belittle the media.
- There is also a related problem associated with science education at universities. Not only are young scientists denied the opportunity to develop their communication skills, but they learn little about the society in which they live and work. They take no arts or humanities. There is no training in

foreign languages. Nothing is taught about ethics, religion or aesthetics. Science is taught and practised in a vacuum that has no history, no humanity and no emotion. It is, therefore, not surprising that so many scientists find it difficult to relate their work to the human community or even to understand that others might be interested in what they are doing. To them giving an interview becomes an ordeal. Obviously, we must change the way science is taught at university.

As Robyn Williams pointed out in a recent (1993) issue of *Australian Way*, the converse is also true. Remarkably few politicians or members of the corporate boards of major Australian companies have any training or understanding of the sciences. No wonder, perhaps, that so many of our politicians show no interest in, concern for, or understanding of environmental and conservation issues, much less of the needs and value of science and education. So when we change the way science is taught, we also need to change the ways in which accountants, lawyers and doctors are taught. The world is too frail to do otherwise.

Allan Sefton showed that it was possible for a lay person to integrate science and conservation. In doing so, he contributed importantly to protecting and enhancing the quality of life of all people. Not just those living in the Illawarra. The world needs many more like Allan Sefton, but it also needs scientists who are equally prepared to work — if need be, to fight — for conservation. This means more than carrying out laboratory and field experiments and publishing the results in scientific journals, however worthy those goals may be. It means becoming part of the community, of getting involved with and for people. More of us who are concerned about the future and the conservation of Australia's biological resources should enter politics.

Allan Sefton provided all of us, scientist and lay person alike, with a model. He gave of himself. There should be more of us prepared to give of ourselves.

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BOOK REVIEWS — BOOK REVIEWS

"Birds of Rottnest Island by Denis A. Saunders and C. Perry De Rebeira.
Illustrated by C. P. de Rebeira.
DAS and CPdeR, Guildford, WA, second (revised) edition. 1933 RRP $16.95.

Rottnest Island is a 1900-ha A-Class Reserve for the conservation of plants and animals. Rottnest is located in the Indian ocean 18 km east of Fremantle, Western Australia, where its size, location, scenery, abundant land and marine life and easy access by boat or plane makes the island a major playground and tourist destination for the city of Perth. Although the quokka, a type of marsupial, may be the best known of Rottnest's wildlife, there is also a rich and abundant avifauna. Forty-nine species of birds occur regularly on the island, but there are many casual visitors. "Birds of Rottnest Island" lists 110 species that have been recorded on the island. Of these, 37 are marine and freshwater species, 26 are waders, including 17 Palearctic waders, and 47 are land birds. This wealth of birds is a reflection of the diversity of habitats on Rottnest Island — woodland, gardens, salt lakes, freshwater marshes, coast and open sea.

"Birds of Rottnest Island" was first published in 1985 in response to the need for a simple guide to the island's birdlife and its many habitats. Rottnest has a flourishing Education Centre and there are regular nature or environment tours, including early morning bird walks. "Birds of Rottnest Island" caters for those people who want to learn more about the environment and the wildlife we share the planet with, but it is also an easy way for casual observers to satisfy their curiosity about the bird they have just seen. "Birds of Rottnest Island" focuses on the 49 species that occur regularly on the island. Each of these is described and illustrated. Perry de Rebeira's illustrations are bold and permit easy identification for even the most naïve of birdwatchers. The status of each species on the island is given, as well as where it is most likely to be found, and enough about its behaviour and feeding habits to encourage careful and prolonged observation. A chapter on the island's main habitats describes their major features and the most common birds found in each. A final chapter gives directions to the best bird-watching locations accompanied by a simple map. The second edition is an update of the first volume, adding new species to the accounts, describing changes in the status of birds, and drawing attention to the island's environmental education programmes.

The authors emphasize that "Rottnest Island is an ideal place to educate people about environmental issues . . ." Saunders and de Rebeira wrote the book because they have a strong personal commitment to environmental education. They have succeeded in achieving their objective. "Birds of Rottnest Island" is a skilful blend of science, environmental education and pleasure. It is a must for anyone planning to visit Rottnest, but I have found my copy to be useful elsewhere in the southwest and frequently refer to it for information about species that also occur in the eastern states.

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